

CLAIMS

What is claimed is:

1. A method for scaling dial-out services provided by a gateway in a data communications network to reduce congestion in the data communications network, the method comprising:
 - 5 by a first gateway, advertising dial-out services for at least one dial-out route to the network via a routing protocol;
 - determining an availability of ports in the first gateway to provide the dial-out services for network nodes that access the first gateway for the dial-out services;
 - 10 transferring from the first gateway to a second gateway dial-out route information corresponding to at least one dial-out route for updating a routing table in the second gateway; and
 - by the first gateway, discontinuing advertising the dial-out services for the at least one dial-out route to effectuate transfer of dial-out services of the at least one dial-out route.
- 15 2. The method according to Claim 1 further including accessing a central database storing static routes corresponding to the transferred dial-out route information.
3. The method according to Claim 2 wherein the central database is stored on a server providing security services.
- 20 4. The method according to Claim 1, further including:
 - issuing a request to the second gateway to transfer the at least one dial-out route corresponding to the dial-out route information prior to transferring the dial-out route.

5. The method according to Claim 4, further including identifying whether the second gateway chooses to accept the at least one dial-out route.
6. The method according to Claim 1, wherein transferring the dial-out route information includes transferring a respective priority level parameter associated
5 with the at least one dial-out route.
7. The method according to Claim 6 further including advertising the transferred at least one dial-out route and respective priority levels by the second gateway to effectuate dial-out service using the at least one dial-out route by the network nodes.
- 10 8. The method according to Claim 1 wherein transferring the dial-out route information further includes transferring at least one transfer termination parameter to limit the length of time dial-out services of the at least one dial-out route is available to the network nodes by the second gateway.
9. The method according to Claim 8 wherein the at least one transfer termination
15 parameter includes at least one of the following parameters: time-to-live, delete-after-complete, or delete-upon-reboot.
10. In a first gateway being used to expand dial-out services in a data communications network, a method for scaling dial-out services provided by the
20 first gateway to reduce congestion in the data communications network, the method comprising:
transmitting a dial-out route transfer request, including dial-out route information, to a second gateway;
updating a routing table in response to receiving notice from the
25 second gateway of a decision to accept the dial-out route transfer request;

transferring the dial-out route to the second gateway; and
discontinuing advertising of dial-out services for the dial-out route to the communications network using a routing protocol to effectuate the dial-out route transfer request to expand dial-out services in the data communications network.

- 5 11. The method according to Claim 10 further including deallocating the dial-out route from a respective gateway port.
12. The method according to Claim 10 further including assigning a lower priority to the dial-out route than the dial-out route has in the second gateway.
13. The method according to Claim 10 further including:
- 10 accessing a database, having records of routing information for network nodes reachable by the network, for a record corresponding to the transferred dial-out route.
14. The method according Claim 13 wherein accessing the database includes communicating with a server providing security services.
- 15 15. The method according to Claim 14 wherein the server is an access, authentication, and authorization server.
16. The method according to Claim 10 further including transmitting a static route transfer duration parameter.
17. The method according to Claim 10 further including forwarding at least one
20 termination parameter to the second gateway to cause the second gateway to terminate the transferred dial-out route according to at least one termination parameter.

18. The method according to Claim 17 wherein the termination parameter includes at least one parameter: time-to-live, delete-after-complete, or delete-upon-reboot.
19. A system for scaling dial-out services provided by a gateway in a data communications network to reduce congestion in the data communications network, the system comprising:
- 5 a first gateway advertising dial-out services for at least one dial-out route to the data communications network via a routing protocol;
- 10 a routing table in the first gateway including the at least one dial-out route, the first gateway transferring to a second gateway at least one parameter related to a static dial-out route in the routing table, the first gateway discontinuing advertising the dial-out services corresponding to the static dial-out route associated with the at least one transferred parameter to reduce congestion in the data communications network.
- 15 20. The system according to Claim 19 wherein the first gateway accesses a server providing a reachability database, the reachability database including static routes accessible by the first and second gateways.
21. The system according to Claim 20 wherein the first gateway is adapted to access the server via security services employed by the server.
- 20 22. The system according to Claim 21 wherein the server is an access, authentication, and authorization server.
23. The system according to Claim 20 wherein the first gateway retrieves dial-out routes from the reachability database.

24. The system according to Claim 19 wherein the first gateway transfers the static route parameters in response to determining a reduced number of gateway ports being able to provide dial-out route services for a static route corresponding to the at least one static route parameters.
- 5 25. The system according to Claim 19 wherein the first gateway advertises non-transferred dial-out routes on the data communications network as a function of increased capacity resulting from transferring the dial-out services for the respective static route.
- 10 26. The system according to Claim 25 wherein the first gateway includes a dial-out route priority parameter in the at least one transferred parameter that the second gateway includes in advertisements about the static route dial-out service to other network nodes.
27. The system according to Claim 26 wherein the first gateway calculates the static route priority parameter.
- 15 28. The system according to Claim 26 wherein the first gateway provides information to the second gateway that allows the second gateway to calculate the static route priority parameter.
- 20 29. The system according to Claim 19 wherein a server including a reachability database accessible by the first and second gateways includes the static route priority parameter in the database.
30. The system according to Claim 19 wherein the first gateway terminates dial-out service of the transferred static route by the second gateway.

31. The system according to Claim 30 wherein the first gateway transfers a termination parameter to the second gateway, the termination parameter causing the second gateway to terminate the transferred static route.
32. An apparatus for scaling dial-out services provided by a gateway in a data communications network to reduce congestion in the data communications network, the apparatus comprising:
- 5 means for transferring dial-out routes from a first gateway to a second gateway;
- 10 means for reducing priority of the transferred dial-out route in the first gateway below the priority of the transferred dial-out route in the second gateway;
- means for updating a routing table in the first gateway; and
- means for discontinuing advertising by the first gateway of the dial-out route via a routing protocol to the data communications network
- 15 as a function of the priority level of the at least one dial-out route.
33. The apparatus according to Claim 32 wherein said means for advertising the dial-out route informs reachable network nodes of respective gateway routes and corresponding gateway route priorities to reduce data flow congestion in the data communications network.
- 20 34. The apparatus according to Claim 32 wherein said means for updating a routing table disables the dial-out route from being accessed via the first gateway by network nodes in the data communications network.
35. The apparatus according to Claim 32 wherein said means for transferring the dial-out route includes means for transferring a terminating parameter that

causes the transferred dial-out route to terminate in the second gateway according to a predetermined condition.

36. A method for dynamically providing dial-out service for a network node by a gateway, the method comprising:

5 determining a state of dial-out services in a first gateway;
 retrieving at least one dial-out route reachable from the first gateway from a central database storing dial-out routes for the first gateway;
 causing a second gateway to update its routing table with the retrieved dial-out route to provide dial-out services to the dial-out route; and
10 discontinuing advertising of the dial-out route via a routing protocol by the first gateway to allow advertising by the second gateway via the routing protocol to cause network nodes to access the second gateway for dial-out services of the dial-out route.

37. The method according to Claim 36 further including re-assessing the state of
15 dial-out route services of the first gateway to restore the retrieved dial-out route in a routing table in the first gateway.

38. A computer program product comprising:

 a computer usable medium for storing data; and
 a set of computer program instructions embodied on the computer usable
20 medium, including instructions to:
 determine a dial-out route is available by a second gateway;
 transfer a dial-out route from a first gateway to the second gateway in a data communications network;
 cause a routing table in the second gateway to include the dial-out
25 route; and

effectuate dial-out services of the dial-out route via a routing protocol by the second gateway to reduce congestion for nodes in the data communications network.

39. The computer program product according to Claim 38 wherein the set of
5 computer program instructions further includes instructions to terminate dial-out route services of the transferred dial-out route by the second gateway.
40. The computer program product according to Claim 38 wherein the set of computer program instructions further include instructions to transfer a priority level parameter associated with the dial-out route.
- 10 41. The computer program product according to Claim 38 wherein the set of computer program instructions further include (i) instructions to advertise dial-out services of the dial-out route to the network via a routing protocol prior to transferring the dial-out route and (ii) instructions to disable advertising dial-out services of the dial-out route following transfer of the dial-out route.
- 15 42. A method for scaling dial-out services provided by a gateway in a data communications network to reduce congestion in the data communications network, the method comprising:
- by a second gateway, receiving from a first gateway dial-out route information corresponding to at least one dial-out route;
- 20 updating a routing table in the second gateway with the dial-out route information; and
- by the second gateway, advertising the dial-out services for the at least one dial-out route to network nodes that access the second gateway to effectuate transfer of dial-out services of the at least one dial-out route.

43. The method according to Claim 42 further including accessing a central database storing static routes corresponding to the transferred dial-out route information.
44. The method according to Claim 43 wherein the central database is stored on a server providing security services.
- 5 45. The method according to Claim 42, further including:
responding to a request from the first gateway to transfer the at least one dial-out route corresponding to the dial-out route information prior to receiving the dial-out route.
46. The method according to Claim 45, further including choosing whether to accept
10 the at least one dial-out route.
47. The method according to Claim 42, wherein receiving the dial-out route information includes receiving a respective priority level parameter associated with the at least one dial-out route.
48. The method according to Claim 47 further including advertising the transferred
15 at least one dial-out route and respective priority levels by the second gateway to effectuate dial-out service using the at least one dial-out route by the network nodes.
49. The method according to Claim 42 wherein receiving the dial-out route information further includes receiving at least one transfer termination parameter
20 to limit the length of time dial-out services of the at least one dial-out route is available to the network nodes by the second gateway.

50. The method according to Claim 49 wherein the at least one transfer termination parameter includes at least one of the following parameters: time-to-live, delete-after-complete, or delete-upon-reboot.
- 5 51. A system for scaling dial-out services provided by a gateway in a data communications network to reduce congestion in the data communications network, the system comprising:
- a second gateway advertising dial-out services for at least one dial-out route to the data communications network via a routing protocol;
- 10 a routing table in a second gateway including at least one dial-out route, the second gateway receiving from a first gateway at least one parameter related to a static dial-out route for adding to the routing table, the second gateway advertising the dial-out services corresponding to the static dial-out route associated with the at least one transferred parameter to reduce congestion in the data
- 15 communications network.
52. The system according to Claim 51 wherein the second gateway accesses a server providing a reachability database, the reachability database including static routes accessible by the first and second gateways.
53. The system according to Claim 52 wherein the first gateway is adapted to access
- 20 the server via security services employed by the server.
54. The system according to Claim 53 wherein the server is an access, authentication, and authorization server.
55. The system according to Claim 52 wherein the second gateway retrieves dial-out routes from the reachability database.

56. The system according to Claim 51 wherein the second gateway receives the static route parameters in response to the first gateway determining a reduced number of gateway ports being able to provide dial-out route services for a static route corresponding to the at least one static route parameters.
- 5 57. The system according to Claim 51 wherein the second gateway advertises transferred dial-out routes on the data communications network as a function of capacity resulting from receiving the dial-out services for the respective static route.
- 10 58. The system according to Claim 52 wherein the second gateway receives a dial-out route priority parameter in the at least one transferred parameter and includes the dial-out route priority parameter in advertisements about the static route dial-out service to other network nodes.
59. The system according to Claim 58 wherein the second gateway calculates the static route priority parameter.
- 15 60. The system according to Claim 58 wherein the second gateway receives information from the first gateway and calculates the static route priority parameter based on the received information.
- 20 61. The system according to Claim 51 wherein a server including a reachability database accessible by the first and second gateways includes the static route priority parameter in the database.
62. The system according to Claim 51 wherein the second gateway terminates dial-out service of the transferred static route by the second gateway.

63. The system according to Claim 30 wherein the second gateway receives a termination parameter from the first gateway, the termination parameter causing the second gateway to terminate the transferred static route.
64. An apparatus for scaling dial-out services provided by a gateway in a data communications network to reduce congestion in the data communications network, the apparatus comprising:
- 5 means for receiving dial-out routes from a first gateway to a second gateway;
- 10 means for increasing priority of the transferred dial-out route in the second gateway above the priority of the transferred dial-out route in the first gateway;
- means for updating a routing table in the second gateway; and
- means for advertising the dial-out route via a routing protocol to the data communications network as a function of the priority level of the at least one dial-out route.
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65. The apparatus according to Claim 64 wherein said means for advertising the dial-out route informs reachable network nodes of respective gateway routes and corresponding gateway route priorities to reduce data flow congestion in the data communications network.
- 20 66. The apparatus according to Claim 64 wherein said means for updating a routing table enables the dial-out route to be accessed via the second gateway by network nodes in the data communications network.
67. The apparatus according to Claim 64 wherein said means for receiving the dial-out route includes means for receiving a terminating parameter that causes the

transferred dial-out route to terminate in the second gateway according to a predetermined condition.

68. A method for dynamically providing dial-out service for a network node by a gateway, the method comprising:

5 determining a state of dial-out services in a second gateway;
 retrieving at least one dial-out route reachable from the first gateway
 from a central database storing dial-out routes for the first gateway;
 updating a routing table in the second gateway with the retrieved dial-out
 route to provide dial-out services to the dial-out route; and
10 advertising the dial-out route via a routing protocol by the second
 gateway to cause network nodes to access the second gateway for dial-
 out services of the dial-out route.

69. The method according to Claim 68 further including removing the dial-out route
15 from the routing table in the second gateway to discontinue providing dial-out
 services for the retrieved dial-out route.

70. A computer program product comprising:

 a computer usable medium for storing data; and
 a set of computer program instructions embodied on the computer usable
 medium, including instructions to:
20 determine a dial-out route is available to a second gateway;
 receive a dial-out route from a first gateway to the second
 gateway in a data communications network;
 cause a routing table in the second gateway to include the dial-out
 route; and
25 effectuate dial-out services of the dial-out route via a
 routing protocol by the second gateway to reduce congestion for nodes

in the data communications network.

71. The computer program product according to Claim 70 wherein the set of computer program instructions further includes instructions to terminate dial-out route services of the transferred dial-out route by the second gateway.
- 5 72. The computer program product according to Claim 70 wherein the set of computer program instructions further include instructions to receive a priority level parameter associated with the dial-out route.
73. The computer program product according to Claim 70 wherein the set of computer program instructions further include (i) instructions to advertise dial-
10 out services of the dial-out route to the network via a routing protocol following receipt of the dial-out route and (ii) instructions to disable advertising dial-out services of the dial-out route following a transfer of the dial-out route back to the first gateway.